Arsenical compounds heated alone on charcoal, or in the open tube with *black flux* give the *odor of garlic.*

Antimonial compounds may be recognized when heated in the open tube, by giving white fumes which are easily driven by heat from one part of the tube to the other, and have not the odor of garlic.

The *compounds of mercury* heated in the matrass with lime or iron filings, yield metallic mercury which sublimes.

The principal ores of *lead and silver* are easily reduced on charcoal alone, and with still more ease, with a little soda.

This list might be much extended, and other characters might be mentioned for many of the substances; but it is believed best to give only those which are most important, and easily remembered.

By applying the principles of chemistry, many other processes will suggest themselves to the intelligent student and as Bergman remarks "celui qui apporte dans ce genre d'experiences une main habile, se fraye tous les jours, de nouvelles routes qui conduisent toutes a la verite."

ART. XIV.—*Notice of the Gold Veins of the United States' Mine near Fredericksburg, Va.;* by Lt. M. F. MAURY, U. S. Navy.

TO THE EDITOR.

Dear Sir—A mutual friend informs me that you have mislaid, or lost, your notes on some of the gold mines in this vicinity; he has requested that I would supply the deficiency; this I cannot pretend to; but as I was with you when you visited the United States' gold mine last summer, I may be able to embody some facts and circumstances, which will bring to your memory the striking features of the lost notes.

If you recollect there are several veins at this mine, which *strike* and *dip*, each in a different direction; the former (the *strike*,) is tortuous, and the angle of the latter is not constant.

The general course of vein No. 1. is about N. E. and S. W., it passes through a micaceous slate, which, near the surface, is soft and fissile, being easily removed with the pick; but at the depth of one hundred and twenty feet, it loses its fissility, and passes into a hornblende (?) slate, which is very compact and is with much difficulty removed by blasting.

Near the surface, the vein dips to the west at an angle of 54° with the plain of the horizon; but as it gains in depth, it curves, gradually approaching a perpendicular, until at the hundred and twenty foot level, (the lowest point at which it has been cut,) where it makes an angle of 20° with a perpendicular.

The vein conforms with the stratification of the slate, the *smooths*, or faces of which, sometimes form, for many feet, regular and beautiful walls to the vein, which walls are as smooth as though they had been chiseled; and were it not for their inclination, the *sides* of the tunnel at such places might be likened to the black walls of a large and narrow dungeon.

The matrix of the vein is quartz, cellular and laminated; the joints or faces of the laminæ being thinly coated with the capel (?) (decomposed shale,) of the lode, and sprinkled with argentiferous galena, blende, (the *black jack* of miners,) and sulphuret of iron; frequently spangles of gold may be seen lodged in the slate, when the quartz is just from the mine, or is freshly cleft. It is difficult to preserve such specimens, for when exposed to the air, whether in the pile, or in the cabinet, the shale already disintegrated and nearly in the form of clay, becomes dry and loses its consistency, when the gold, having nothing to support it, falls off. In juxtaposition to the pyrites, irregular crystals of the ferruginous sulphuret of copper are occasionally seen, which from their peculiar yellowish hue, are often taken for gold. Some specimens on their faces of cleavage are studded with perfect and beautiful crystals of the phosphate of lead; these surfaces are frequently variegated with tints of black, brown, purple and yellow; and the green acicular prisms grouped in circles, lines and broken curves, present the appearance of crescents, flowers, etc. raised on the quartz in fancifully embossed work of green moss. The molybdiate and venidiate of lead are also found in this vein.

The thicknes of the vein is variable; at some places it is near three feet, at others it thins out into a mere *thread* or seam, then widens again. After being cut by a *cross-course* of pure white quartz, it thinned out, and entirely disappeared for a few feet. Here its course was marked by a black seam between the walls; after driving a few feet on this seam, the vein was found replacing it.

At the time when the fissure which contains this vein, was formed, causes existed, to prevent regularity in the angle of inclination, as well as in the course of the vein. At one place in the eighty foot level the vein deflects from its course, forms almost a semicircle,

and again comes into its former line of bearing. Above this deflection, the course of the vein in the forty foot level is continuous and there does not appear to have been any interruption in its angle of inclination, or in its line of bearing.

The other veins have an average thickness greater than that of No. 1. They are walled up near the surface in red clay, a perpendicular escarpment of which shows a succession of black lines or seams, in the regular order of stratification. Suppose a bed of gneiss to be converted, without undergoing the process of disintegration, into a mass of clay, or red earth, and that the lines showing the stratification of the gneiss were to assume a blackish hue, and be retained in the clay, and you would have a formation similar to that of which I am now writing. Disseminated through this clay, are numerous *untriturated* and angular fragments of translucent quartz, the largest of them attaining to the weight of only a few grains.

Veins Nos. 2. and 3. are parallel or nearly so; their general course is N. by E; they dip to the east. No. 2. at an angle of 30° with a perpendicular. No. 3. is nearly perpendicular from the surface to the depth of twenty five or thirty feet; while at the depth of sixty feet it has a very great *underlay*, declining from a perpendicular at an angle of near 60°.

The two veins are about one hundred feet apart; The *country* between them at the depth of sixty feet, is very soft, not being firmer than quicksands. The angle of inclination of No. 2. is quite uniform. At the sixty foot level, instead of red clay, the veins are contained in decomposed gneiss, which retains its color and texture, but is quite friable, yielding as readily as the clay, to the pick. A shaft has been sunk perpendicularly on No. 3. vein to the depth of twenty five or thirty feet; in this the vein declines from a perpendicular at a very small angle, say 5°; immediately under this shaft, in the sixty foot level, the vein inclines at an angle of 45°. I shall not offer at this time any conjecture as to this anomaly in the dip of veins. When the ore between the sixty foot level and the surface, is taken down, this very great underlay will doubtless be found to commence at, or near, the junction of the gneiss with the superincumbent clay. Circumstances which will throw more light on the subject may be then brought to view. Could it have been that the *soft country*, or quick sands alluded to, were not sufficiently firm and compact to support the vein in its nearly perpendicular position, and that for the want of proper support, it has fallen down as it

were? Veins usually underlay more near the surface where the ground is less firm, than they do in depth, where they pass through rocks and a harder country; such is the case with No. 1. vein, and it is conformable with the laws which veins in their dip usually follow. In miners' phrase the country between the depths of forty five and sixty feet and about these veins, has been much *confused*. No. 2. vein has a *heave* of about five feet to the west. Here there are countless threads of the vein, some a foot, others a yard, and others a fathom or more in length, and an inch in thickness, laying horizontal and *across* the course of the vein, as if this had been suddenly broken asunder and violently thrown one side, leaving fragments strewed along its track. Threads of similar quartz frequently accompany the vein, but instead of laying horizontally and across its course, they diverge from it, run parallel to it with nearly the same inclination and finally come into the vein again.

Opposite to this heave, I expected to find a corresponding, or the marks of a corresponding heave in No. 3. vein. But instead of that, the country was more firm, the stratification of the gneiss was undisturbed, the vein thinned out and entirely disappeared; it was replaced by *killas* which marked its course for more than forty feet, when the vein again formed, being much richer here than it was where it disappeared.

The quartz from each of these veins has very much the same appearance and the same accompanying minerals. With a slight blow on its vertical edge, its tendency is to cleave readily into rhomboidal plates, but the cross cleavage not being perfect it divides into irregular oblong plates, the faces of which are mottled with the black oxide of manganese under the dentritic form, many of them presenting, with a little aid from fancy, beautiful landscape views in miniature.

Most of this quartz is translucent; it fractures with almost a milky whiteness. In some specimens the gold may be seen *within* the gangue, relieving its whiteness with delicate orange colored spots. Here the sulphuret of iron is more rare, blende and galena are seldom seen, while pyritous copper and malachite are more abundant; spots of black tourmaline are occasionally seen; and the iron pyrites assume a reticulated appearance.

Vein No. 4 lies W. N. W. and E. S. E. and dips to the north. It is between four and five feet thick. The quartz is similar in its tabular structure to that from veins No. 2 and 3; but the associated

minerals of those veins, excepting the iron, are wanting here. The cubes of sulphuret of iron, in the middle of compact (externally) masses of gangue, have slowly yielded to the action of a destroying cause; their materials have gradually assumed a gaseous or more subtile form, and by permeation, or some other mysterious process, they have passed off, leaving a stain of iron upon the quartz, and oftentimes a spangle of gold glittering in the cubical cell which the pyritous crystal formerly filled: sometimes the interior of the rock is completely honeycombed by these empty cells. This vein has not been extensively explored. It dips at an angle of 45°, and like Nos. 2 and 3 is found passing through a stratified red earth, that contains numerous angular fragments of translucent quartz. The sulphate of baryta is one of the associated minerals of vein No. 1.

These veins, striking on different courses, and dipping at various angles and in different directions, cross each other at several points, forming thereby a sort of *veinous net-work* over the company's lands. Such is the character of *retiform deposits*, whether the veins be true, or contemporaneous veins. And such is the tendency of the veins at several other mines which I have visited. The establishment of the fact, whether or not the gold region be a *retiform deposit*, would be an important point gained in the economy of gold mining in this country. This is a task which belongs to others, and to them I shall leave it.

Parallel to the "gold belt" of Virginia, and running along its eastern borders, is a deposit of iron ore, which is not second to the gold region, either in value or importance. The ore is a *brown hematite*, of superior quality. It yields an excellent gray iron. Previous to the Revolution, several furnaces were supplied from it, but almost the only record which we have of their existence is found in their ruins; the piles of scoria, the extensive forests of second growth, numerous excavations, and mounds of earth, are the only monuments which tell of their former operations and prosperity. The beds were mined in a very loose way, and the ore extracted does not obviously lessen its abundance. The deposit passes with the gold belt out of the state, and perhaps continues with it throughout its range.

It is not improbable, that upon examination, the geological position of the coarser but more useful metal, with regard to the more precious, will be found useful in an economical point of view. The field of my observations is a small one, but I do not know of any mine of "vein gold" to the east of the iron range. There are sev-

eral alluvial deposits of gold to the eastward of it; they are known under the name of *deposit* or *surface* mines; they are worked with profit. The gold has probably been brought to them, by the agency of water, from veins to the westward of and above the iron belt. It would be a striking feature in the geology of the state, should deposits of the two most extensively distributed metals in nature, be found in juxtaposition to each other, for many miles, each marking the limits of the other, without ever encroaching upon its borders.

Art. XV.—*Chronometers.*

Having in Vol. xxix, at p. 279 of this Journal given publicity to the experience of those eminent chronometer makers, Messrs. Parkinson & Frodsham, of London, we now readily extend the same courtesy to Messrs. Arnold & Dent,* of that city; aware also that, after Great Britain, no country has so deep an interest in chronometers as this, for every sea is whitened by our canvass.

The following passage from Obed Macy's History of Nantucket describes the case of many thousands of our countrymen.

"The wide ocean is the source of their livelihood, and they breast its waves and grapple with its monsters, in every latitude between the polar ices. The sun never sets on their industry; they labor and worship under the whole dome of the firmament. The objects of their affections are abroad on the deep, or buried forever beneath its billows; their prayers are wafted on every wind and their tears are mingled with every surge."

To these adventurous labors of the intrepid whalemen, the chronometer is indispensable, for the longitude, and it is said that New Bedford, the neighbor and friendly rival of Nantucket, has the time keepers at this moment to the amount of $87,000.

On the Application of Glass, as a substitute for Metal Balance Springs in Chronometers.

[From the Nautical Magazine, for December, 1836.]

Sir,—On several occasions we have occupied a space in your valuable journal with some account of experiments which we have made,

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* Note from Messrs. Arnold & Dent, dated London Dec. 8, 1826.—Messrs. Arnold & Dent beg to present Prof. Silliman with an account of their experiments on metal and glass balance springs of chronometers, and also the official rates of two chronometers having glass balance springs and balances, *tried* by order of the Lords Commissioners of the Admiralty.